

(Draft)

afs.pl

(Auto Form Submit, a Perl Script for Accessing the ACE Science Data Archives Remotely)

Syntax

```
afs.pl args
```

or

```
perl afs.pl args
```

Overview

The Perl script **afs.pl** utilizes the *libwww-perl* library routines (see below) to provide a capability to programmatically request data from the Ace Science Center (ASC) data archives. Data retrieval from the ASC was previously only via a series of interactive web screens.

afs.pl was written to test the existing (legacy) Applications Programming Interface to the ACE data via the internet. It may in the future become a component of a middleware that would connect the ASC to future virtual observatories. It may also be useful as a stand-alone application. No changes to the existing API were made to accommodate afs.pl. **afs.pl** simply makes use of features of the ACE web data server that have existed for years. Changes to the ACE data server API may be made in the future to better accommodate programs like **afs.pl**.

The capability to support requests for simple plots of the ACE data has recently been added. Additional optional arguments are available for some control of plot appearance. (see the Plots section below)

The *afs.pl* program is called by invoking the program name with parameter strings on the command line. Output is to stdout.

Assumptions and Limitations

Minimal error-checking of the commandline args is performed. This is a preliminary version of the program. Error checking may in the future be performed by some TBD wrapper or calling routine.

Only MAG or SWEPPAM Level 2 data may be requested at this time.

Dates bounding data requests of MAG 16sec and 4min averages and SWEPPAM 64sec averages may NOT span year boundaries. Dates bounding data requests of hourly and daily averages may span year boundaries.

For requests that generate large byte-count replies, the data are zip-compressed, and an HTML message containing the URL of the compressed file is returned instead of the data itself. Example: MAG 16sec averages for a 200 day period. This is an example of a case where the existing ACE data server API could be improved.

It is assumed the Perl library making this whole thing work, LWP (library for world wide web Perl modules), is installed. See the libwww-perl section below for details.

Arguments

A list of space separated strings. No embedded blanks unless "quoted".

The order of the arguments is not important, except for arguments following the `-s` and `-e` and the optional `-title` and `-ytitle` args. See below.

Upper/Lower case of letters within arguments is not significant.

Instrument arguments

One of the following instrument args is required:

Mag swepam

(not yet implemented: cris epam sepica sis
swics/swims uleis mag/swepam)

Time Average arguments

For MAG, one of the following time average args is required:

16sec 4min 1hr hourly 1day daily

For SWEPAM, one of the following time average args is required:

64sec 1hr hourly 1day daily

Start and End Date arguments

A start date and an end date are required:

-s *YR_start DOY_start* example: "-s 1999 3"

-e *YR_end DOY_end* example: "-e 1999 22"

Note: Year values may be 2-digit or 4-digit values. Day of year values may be 1, 2 or 3 digit values with leading zeros OK.

Data arguments

One or more data args are required:

For MAG:

year, day, hr, min, sec: year, day of year, hour of day, minutes, seconds.
fp_year : fractional year.
fp_doy : fractional day-of-year.
ACEepoch : seconds since Jan 1 00:00:00 UT 1996.
SCclock : ACE spacecraft clock counter (seconds).
Brtn_r : R-component of mag. field in RTN (nT).
Brtn_t : T-component of mag. field in RTN (nT).
Brtn_n : N-component of mag. field in RTN (nT).
Bmag : <|B|> magnetic field magnitude (nT).

Delta : RTN latitude.
 Lambda : RTN longitude.
 Bgse_x : X-component of mag. field in GSE (nT).
 Bgse_y : Y-component of mag. field in GSE (nT).
 Bgse_z : Z-component of mag. field in GSE (nT).
 Bgsm_x : X-component of mag. field in GSM (nT).
 Bgsm_y : Y-component of mag. field in GSM (nT).
 Bgsm_z : Z-component of mag. field in GSM (nT).
 dBrms : RMS values of underlying high-resolution measurements (nT).
 sigma_B : Variance of $|B|$, i.e. $\sqrt{(|B| - \langle |B| \rangle)^2}$ (nT).
 fraction_good : Fraction of the period for which data was available
 N_vectors : Num of hi-res (16-sec) points included in the average.
 Quality : 0 = Normal data.
 : 1 = Spacecraft Maneuver and high-nutation period
 : 2 = Bad or missing data, (data values set to -999.9)
 pos_gse_x
 pos_gse_y
 pos_gse_z : Components of spacecraft position in GSE (km).
 pos_gsm_x
 pos_gse_y
 pos_gse_z : Components of spacecraft position in GSM (km).

For SWEPAM:

year, day, hr, min, sec: year, day of year, hour of day, minutes, seconds.
 fp_year : fractional year.
 fp_doy : fractional day-of-year.
 ACEepoch : seconds since Jan 1 00:00:00 UT 1996.
 H_density : Proton Density (cm^{-3}).
 H_temp : Radial Component of proton temperature (deg. Kelvin).
 Alpha_ratio : Ratio of alphas/protons
 H_speed : Proton Speed (km/s)
 Vgse_x
 Vgse_y
 Vgse_z : X,Y,Z-components of proton velocity in GSE coords (km/s)
 Vrtn_r
 Vrtn_t
 Vrtn_n : R,T,N-components of proton velocity in RTN coords (km/s)
 Vgsm_x
 Vgsm_y
 Vgsm_z : X,Y,Z-components of proton velocity in GSM coords (km/s)
 pos_gse_x
 pos_gse_y
 pos_gse_z : Components of spacecraft position in GSE (km).
 pos_gsm_x
 pos_gse_y
 pos_gse_z : Components of spacecraft position in GSM (km).

Example

```
perl afs.pl mag 16sec year day hr min sec Bmag Bgsm_x  
Bgsm_y Bgsm_z -s 2003 331 -e 2003 340 > foo
```

...where the filename foo will contain the ASCII text results of the request; in this case, 16 second MAG data for days 2003/331 thru 2003/340, returning data consisting of records with the fields: year, day of year, hour, minute, second, <|B|>, Bgsm_x Bgsm_y, and Bgsm_z..

Plotting Options

It is possible to obtain a simple GIF time-series plot of the data, instead of the data itself. Output is an HTML message with the URL of the plot embedded, unless the “url” argument is supplied (see below).

Plotting arguments

`plot` - use this argument to obtain a GIF plot instead of data.

The following arguments are optional and may be used to modify the plot appearance:

`overplot` or `stacked` (default)

`logarithmic` or `linear` (default)

`multirange` or `samerange` (default)

`x_year`, `x_epoch`, `x_records` or `x_day` (default)

`-title` “*plot-title*”

`url` - Output is a URL to the plot, with no enveloping HTML message.

Note: for a plot request, the time variables (year, day, hr, min, sec, etc.) should not generally be included on the command line, since they will be plotted along with the data.

The libwww-perl Library

The libwww-perl collection is a set of Perl modules which provides a simple and consistent application programming interface to the World-Wide Web. The main focus of the library is to provide classes and functions that allow you to write WWW clients. The library also contain modules that are of more general use and even classes that help you implement simple HTTP servers.

The [latest libwww-perl package](#) as well as [perl itself](#) are available on [CPAN](#) (Comprehensive Perl Archive Network). This is also the place to obtain the other packages that libwww-perl depends upon ([URI](#), [HTML::Parser](#), [MIME::Base64](#), [Digest::MD5](#), and [Net::FTP from libnet](#)).